Section 6
Consolidated Water Conservation and Drought Management Recommendations for the Regional Water Plan [31 TAC §357.7(a)(11)]

6.1 Municipal Water Conservation (See Section 4.4.1.1)

6.1.1 Municipal Water Conservation Water Management Strategy

Municipal water conservation is included in the Llano Estacado Regional Water Plan. The objective of the municipal water conservation option is to reduce per capita water use at a rate of 1 percent per year for those municipalities with projected needs (shortages) until the municipality's per capita water use is at year 2000 region-wide average per capita water use of 172 gpcd. The potentials for municipal water conservation in addition to that expected from the continued use of low flow plumbing fixtures in the Llano Estacado Region are about 10,424 acft/yr in 2060, or about 9.8 percent of the projected 2060 municipal demand. Although the potential is modest, it is very important that municipal water conservation continue to be emphasized through active public information and education programs in the public schools, through the media, and at the individual water utility levels. With respect to the latter, it is suggested that each water utility of the region measure its water distribution system leaks and unaccounted for water and set goals to bring this parameter into the 12 to 15 percent range. In addition, during droughts municipalities are expected to follow their respective Demand Management and Drought Contingency Plans and to practice additional water conservation, if needed.

6.1.2 Survey of Implementation of Municipal Water Conservation Water Management Strategies in Llano Estacado Water Planning region

The LERWPG included the municipal water conservation survey presented below in order to obtain information about the extent of the implementation of municipal and irrigation water conservation water management strategies included in the 2006 Llano Estacado Regional Water Plan. During the summer of 2009, a mail survey of the 51 municipalities of the Llano Estacado Water Planning Region was conducted to obtain information about the extent and success of municipal water conservation programs that are being implemented in the region. The survey form contained the following list of questions:

(1) When was your current water conservation plan initiated?
(2) What water conservation program(s) are currently being implemented by your organization?
(3) What is the percent reduction in water consumption attributed to your water conservation program, as measured by either average or peak gallons per person (or connection) per day consumption?
(5) What is the primary objective of your water conservation program?
(6) Is your organization already implementing any of the voluntary BMPs (list provided)?
(7) Of those not being currently implemented, is your organization interested in pursuing any of the 13 BMPs listed?
(8) If so, which ones?
(9) If not, please describe why (please check all that apply)?
(10) Would you like a follow-up phone call to discuss specific best management practices, or water conservation assistance programs?

The TWDB Municipal Water Conservation Best Management Practices (BMPs) list of November 2004 was included with the survey form, as follows:

1. System Water Audit and Water Loss;
2. Water Conservation Pricing;
3. Prohibition on Wasting Water;
4. Showerhead, Aerator, and Toilet Flapper Retrofit;
5. Residential Toilet Replacement Programs;
6. School Education ;
7. Water Survey for Single- Family and Multi-Family Customers;
8. Landscape Irrigation Conservation and Incentives and Water Wise Landscape Design and Conservation Programs;
9. Metering of All New Connections and Retrofit of Existing Connections
10. Public Information;
11. Rainwater Harvesting and Condensate Reuse; and
12. New Construction Graywater (or Retrofit of Existing Households); and
13. Conservation Programs for Industrial, Commercial, and Institutional Accounts.

Of the 51 municipal water users to which the survey was sent, 43 responded, for a response rate of 84 percent. Of those responding, one reported that it has a drought contingency plan and one indicated that it does not have a water conservation plan.

Dates Water Conservation Plans Implemented: The dates of implementation of water conservation plans, as reported in the survey, ranged from one (1) in 1989, the earliest, to 4 between 1990 and 2000, 6 in 2000, 5 during 2001 to 2003, 7 between 2004 and 2006, 6 during 2007 and 2008, 5 in 2009, and 7 did not provide a date of plan implementation (see List A below).

List A: Date Water Conservation Plan Implemented

Date Plan Implemented	Number
Before 1990	1
1990 to 1999	4
2000	6
2001 to 2003	5
2004 to 2006	7
2007 to 2008	6
2009	5
No Date Given	7
No Plan	2
Total	43

Water Conservation Practices Used: The survey response to water conservation practices and programs being used indicates that public information, leak detection, repair, and monitoring, and meter testing, repair, and replacement are the main water conservation practices in use within the region, with plumbing retrofit being used by only one respondent (see listing below). Meter testing, repair, and replacement was used by 81 percent of the respondents, Leak detection, repair, and monitoring was used by 67 percent of respondents, and 65 percent used public information (see list B below). Of the total respondents, 21 or 49 percent reported that the following three water conservation practices (Public Information, Leak Detection, Repair, and Monitoring, and Meter Testing, Repair, and Replacement) were being used.

List B: Water Conservation Practices Being Used

Water Conservation Practices Used	Number of Users
Public Information	28
Showerhead/Aerator/Toilet Flapper Retrofit	1
Leak Detection, Repair, Monitoring	29
Meter Testing/Repair/Replacement	35
Landscape Irrigation Conservation	6
Other (please specify) (water audit, line upgrades, school education, and tiered rates	5

Water Conservation Budget: To the question, "What is the current budget for water conservation programs, or what is water conservation budget as prevent of total water budget?" 11 (25 percent) of the 43 municipalities surveyed did not provide a response, 10 (23 percent) responded that the budget for water conservation was zero, 4 (9 percent) responded that the water conservation budget was less than 1 percent of the water budget, 13 (30 percent) indicated that the budget for water conservation ranged between 1 percent and 10 percent of the water budget, and 4 (9 percent) responded that the water conservation budget was greater than 10 percent of the water budget.

Reduction in Water Use Through Water Conservation: The survey response to the question pertaining to reduction in water use due to water conservation programs ranged from a response that no reduction had been accomplished (39) percent of respondents, to 15 to 20 percent reduction by one respondent (see List C below). Three respondents indicated that the effects of water conservation programs has been a reduction in leaks of as much as 20 percent, one respondent indicated that water conservation is being practiced to control water rates, and one respondent indicated that water conservation is being used for something other than reduction of water use, but did not indicate what the "other purpose" is.

List C: Reduction in Water Use

Percent Reduction in Water Use	Number of Users
Zero (0)	17 (39%)
1 to 5	15 (35%)
5 to 10	4 (9)
15 to 20	1 (2.3%)
Other Results	3 (6.9%)
No Plan/No Response	3 (6.9%)
Total	43

Primary Objectives of Water Conservation: The response to the question of primary purpose of water conservation programs indicated that 67 percent of respondents are using water conservation programs to reduce unaccounted for water, about 41 percent are attempting to reduce per capita water use, 39 percent are attempting to reduce peak demands, and 41 percent have more than one of the objectives listed (see List D below).

List D: Primary Objectives of Water Conservation

Objectives of Water Conservation	Number of Users
Reduce Peak Demands	17 (39%)
Reduce Per Capita Water Use	18 (41%)
Reduce Unaccounted for Water	29 (67%)
Other	0
More than one objective	18 (41%)

Implementation of Best Management Water Conservation Practices (BMPs): With respect to questions about use or implementation of the TWDB Water Conservation Best Management Practices (BMPs) listed in the survey, 21 (49 percent) indicated that the BMPs are being implemented, 10 (23 percent) responded that the BMPs were not being implemented, and 12 did not respond to the question. With regard to "interest in implementing BMPs," 14 (32 percent) responded that they are interested, 14 (32 percent) responded that they are not interested in implementing BMPs, 14 (32 percent) responded "maybe," and one did not respond to the question. The respondents indicated that the BMPs of most interest are (10) Public Information, (11) Rainwater Harvesting and Condensate Use, (12) Graywater in New Construction, (9) Metering of all New Connections, and (6) School Education. Five respondents indicated an interest in BMP Number 2, Water Conservation Pricing, and two expressed interest in Number 5, Residential Toilet Replacement.

Reasons for Lack of Interest in Best Management Practices (BMPs): Of the responses to this question, 22 (51 percent) indicated that cost was the reason for lack of interest, 20 (46 percent) indicated that lack of staff was the reason, 9 (21 percent) indicated that impact to revenues was the reason, 3 (7 percent) indicated that water supply is not susceptible to drought, and 4 (9 percent) indicated that existing water conservation program is effective.

Summary of Results of Water Conservation Survey: The response rate to the municipal water conservation survey was 84 percent (43 of 51). Of the 43 respondents, 5 (12 percent) have water conservation plans that were implemented before year 2000, 5 (12 percent) were implemented in 2009, 18 (42 percent) were implemented between 2001 and 2008, 2 (4 percent) have no water conservation plan, and 7 (16 percent) did not give did not indicated the date of plan implementation.

The principal water conservation practices used by the survey respondents are Public Information, Leak Detection, Repair, and Monitoring, and Meter Testing, Repair, and

Replacement. Approximately 40 percent of respondents indicated that water conservation is not reducing water use, 35 percent of respondents indicate water use reductions of 1-5 percent, and one respondent reported reductions of 15 to 20 percent.

The reported principle objectives of water conservation are to Reduce Peak Reduce Unaccounted for Water (67 percent), Reduce Per Capita Water Use (41 percent) and Reduce Peak Demands (39 percent). Twenty-one (49 percent) of respondents indicated that the BMPs are being implemented, According to the survey, the BMPs of most interest are (10) Public Information, (11) Rainwater Harvesting and Condensate Use, (12) Graywater in New Construction, (9) Metering of all New Connections, and (6) School Education. Five respondents indicated an interest in BMP Number 2, Water Conservation Pricing, and two expressed interest in Number 5, Residential toilet Replacement. Reasons given for lack of interest in BMPs were cost (51 percent of respondents), lack of staff (49 percent of respondents), and impact to revenues (21 percent of respondents).

6.2 Irrigation Water Conservation (See Section 4.4.1.2)

6.2.1 Irrigation Water Conservation Water Management Strategy

The use of agricultural water conservation BMPs on farms, and an irrigation water conservation water management strategy are included in the Llano Estacado Regional Water Plan in order to sustain the present water supplies, enhance agricultural profitability, and enhance playa basins for wildlife habitat and aquifer recharge. In the Llano Estacado Region, both irrigation and non-irrigated (dryland farming) is practiced. For the most part, the irrigated acreages are those acres lying above saturated sections of the Ogallala aquifer that have sufficient quantities of water to justify drilling, equipping, and pumping irrigation wells. Such wells supply water that is used to supplement precipitation for crop production.

Irrigated and dryland farming attempts to maximize the efficiency of use of irrigation water and precipitation in the area. This is done through the use of Irrigation BMPs, including LEPA and LESA irrigation systems, in conjunction with furrow diking and plant residue management. The Irrigation Water Conservation Water Management Strategy included in the 2006 Llano Estacado Regional Water Plan was that irrigation producers of crops install and use Center Pivots (LEPA or LISA) for the application of irrigation water. LEPA (Low Energy

Precision Application Systems) is a center pivot application system that discharges water directly into furrows at low pressure, thus reducing evaporation losses. LESAs (Low Elevation Spray Application Sprinklers) are center pivot and lateral move low elevation/pressure sprinklers that spray water downward above the crops as the sprinkler systems move across the fields. When LEPA and LESA systems are used in conjunction with furrow dikes, which hold both precipitation and sprinkler applied water behind small mounds of earth within the furrows, these systems can accomplish the irrigation objective with less water than is required for the furrow irrigation and pressurized sprinkler methods.

6.2.2 Extent of Implementation of Irrigation Water Conservation Water Management Strategies in Llano Estacado Water Planning Region

Using year 2004 infrared orthographic imagery and ESRI ArcView 9.0, the High Plains Underground Water Conservation District No. 1, showed that in the Llano Estacado Region in 2004, there were 17,482 center pivots irrigating approximately 2.36 million acres, or 71.88 percent of irrigated acres in the region in 2004.[1] However, approximately 982,511 irrigated acres in the region were not being irrigated using efficient center pivot or drip systems, and some farmers were not using other available water conservation practices, as identified and recommended by the Water Conservation Implementation Task Force and the Llano Estacado Regional Water Planning Group.

In 2009, the High Plains Underground Water Conservation District No. 1, performed a similar survey to that of 2004 of counties of the Llano Estacado Water Planning Region using infrared orthographic imagery and ESRI ArcView, which showed that in 2008, there were 18,619 center pivots irrigating approximately 2.49 million acres (Table 6-1).[2] Between 2004 and 2008, the number of center pivots increased from 17,482 to 18,619 (1,137 or 6.5 percent), with an increase in acres irrigated with center pivots from 2,359,980 acres to 2,494,823 acres, an increase of 134,843 acres, or 5.7 percent (Table 6-1). Although the number of center pivots and acreages irrigated using center pivots increased between 2004 and 2008, there were decreases in 4 counties (Bailey, Garza, Hockley, and Terry). The decrease in Terry County is reported to be conversion to dryland production.

[1] Center Pivot Inventory, High Plains Underground Water Conservation District No. 1. October 2005.
[2] Ibid.

Table 6-1
Number of Center Pivots and Acreages Irrigated Using Center Pivots
Llano Estacado Region

	Number of Center Pivots			*Acres Irrigated with Center Pivots*		
County	*2004*	*2008*	*Change*	*2004*	*2008*	*Change*
(A)	*(B)*	*(C)*	*2004/2008*	*(D)*	*(E)*	*2004/2008*
Bailey	768	739	-29	92,598	88,786	-3,812
Briscoe	110	163	53	13,216	18,422	5,206
Castro	1,378	1,459	81	218,174	225,398	7,224
Cochran	615	666	51	81,849	86,093	4,244
Crosby	551	588	37	74,712	79,942	5,230
Dawson	595	647	52	72,250	75,543	3,293
Deaf Smith	845	896	51	134,741	142,549	7,808
Dickens	44	47	3	4,166	4,670	504
Floyd	541	705	164	79,587	100,308	20,721
Gaines	2,101	2,179	78	324,545	330,425	5,880
Garza	35	27	-8	4,457	3,311	-1,146
Hale	1,631	1,823	192	221,739	242,062	20,323
Hockley	931	906	-25	109,440	105,949	-3,491
Lamb	1,737	1,835	98	207,064	216,776	9,712
Lubbock	743	830	87	94,691	102,392	7,701
Lynn	497	572	75	61,053	69,482	8,429
Motley	53	61	8	5,500	6,974	1,474
Parmer	1,788	1,792	4	217,754	216,213	-1,541
Swisher	371	467	96	65,626	83,343	19,717
Terry	1,409	1,392	-17	171,193	169,128	-2,065
Yoakum	739	825	86	105,625	127,057	21,432
Total	17,482	18,619	1,137	2,359,980	2,494,823	134,843

Based upon the results of the survey using infrared orthographic imagery and ESRI ArcView of number of center pivots, as described above and as shown in Table 6-1, it appears that the recommended irrigation water conservation management strategy is being implemented in the Llano Estacado Water Planning Region, with the resulting water conserved being a contribution toward somewhat reducing the projected water shortages for the irrigation water user group.

6.3 Drought and Drought Response

Water supplies are included in Section 3 of the Llano Estacado Regional Water Plan as firm yields during drought of record for surface water sources, and dependable supplies during drought of record for groundwater sources (i.e., drought of record conditions underlie the calculations of water supply available from each source included in Section 3 for each water user group). Therefore, each source of supply is for drought conditions. In addition, in accordance with requirements of Senate Bill 2, TCEQ has required retail water suppliers to prepare drought contingency plans.

Given that the major source of water for all uses in the Llano Estacado Region is the Ogallala Aquifer, with surface water from the Canadian River Municipal Water Authority, White River Municipal Water District, and Mackenzie Municipal Water Authority for some municipal and industrial uses, the effects of drought are through reduced flows of surface water into existing water supply lakes and increased demands upon the water supply facilities to provide larger quantities of water from each water supply source. For example, in the region, demands increase during droughts, placing ever-greater demands upon wells, pumps, motors, storage facilities, and the aquifer and surface water reservoirs. Therefore, the primary factor specific to each water supply is atmosphere conditions affecting precipitation, evaporation, and evapotranspiration. Thus, when atmospheric conditions result in: (1) reduced precipitation and (2) increased evaporation and evapotranspiration, the Llano Estacado Regional Water Plan recommendation is that drought response be initiated as described below.

Drought Trigger Conditions will be based on local atmospheric conditions using the currently available PET stations. For the purposes of this planning cycle, it is recommended that local precipitation be factored into the consideration of implementing a drought trigger. Recommended drought triggers are presented as follows.

- **Alert Stage of Drought**: Precipitation at less than 50 percent of the 30-year average for the month and 55 percent of the 30-year average of the preceding 12 months.
- **Warning Stage of Drought**: Precipitation at less than 25 percent of the 30-year average for the month and 45 percent of the 30-year average of the preceding 12 months.

The Llano Estacado Water Planning Area is divided into geographical areas based upon location of existing PET stations for drought trigger and response purposes. The current locations of PET stations within Region O are Dimmitt, Earth, Farwell, Halfway, Lamesa, Lubbock, and

Seminole. The drought trigger and response zones in the Llano Estacado Water Planning Area are shown in Table 6-2.

Table 6-2.
Drought Trigger and Response Zones
in the Llano Estacado Water Planning Area

PET Stations	*Counties*
Dimmitt	Castro, Deaf Smith, and Swisher
Earth	Cochran and Lamb
Farwell	Bailey and Parmer
Halfway	Briscoe, Floyd, Hale, and Motley
Lamesa	Dawson, Garza, and Lynn
Lubbock	Crosby, Dickens, Hockley, and Lubbock
Seminole	Gaines, Terry, and Yoakum

6.4 Drought Response

As the LERWPG is a planning body only, with no implementation authority, it is emphasized that these drought triggers and responses are recommendations only. Since local public water suppliers and water districts are all required to have adopted a Drought Contingency Plan that contains drought responses unique to each specific entity, these entities are the only ones who have the authority to manage their particular water supply or area of authority. Therefore, the LERWPG recommends that these entities carry out their respective plans based upon the triggers listed above. For Example:

When the Alert Stage Drought Conditions have been triggered as described above, the (RELEVANT BODY, COMMITTEE, ETC.) will notify all affected entities in the relevant geographical area. Those entities exercise their authority to implement their own Drought Contingency Plans, as they deem necessary.

When the Warning Stage Drought Conditions have been triggered as described above, the (RELEVANT BODY, COMMITTEE, ETC.) will notify all affected entities in the relevant geographical area. It is recommended that these entities exercise their respective authority(ies) to implement their own Drought Contingency Plans, as they deem necessary.

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